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09/540,524	03/31/2000	Jose Tamez-Pena	000687.00138	1816

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WASHINGTON, DC 20006

EXAMINER

FETZNER, TIFFANY A

ART UNIT	PAPER NUMBER
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2862

DATE MAILED: 07/25/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.  
09/540,524

Applicant(s)  
Jose Tamez-Pena et al.,

Examiner  
Tiffany A. Fetzner

Art Unit  
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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

1) ☒ Responsive to communication(s) filed on 06/28/2002 and 07/08/2002

2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

## Disposition of Claims

4) ☒ Claim(s) 1, 2, 4-13, 28, 29, and 31-40 is/are pending in the applica

4a) Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from considera

5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.

6) ☒ Claim(s) 1, 2, 4-13, 28, 29, and 31-40 is/are rejected.

7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.

8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirem

## Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some\* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

4) ☒ Interview Summary (PTO-413) Paper No(s). 11

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

5) ☐ Notice of Informal Patent Application (PTO-152)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). \_\_\_\_\_

6) ☐ Other:

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**DETAILED Final ACTION**

1. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

2. ***Drawings***

3. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

**4. Election with traverse**

5. The election of claims 1, 2, 4-13, 28, 29, and 31-40 with traverse from the March 13th 2002 response has been noted. **Claims 3, 14-27, 30, and 41-54** are withdrawn from consideration by the examiner as claims being drawn to a non-elected invention.

6. ***Response to Arguments***

7. Applicant's Response filed 07/08/2002 have been fully considered but they are not persuasive. Applicant argues on page 2 paragraph 1 of the July 8th 2002 response that the interpretation of component numbers 60, 62, 64, 70, 72, 74, and 50, 52, and 54 is incorrect by the examiner, because components 60, 62, and 64 are parallel back-projected lines on slices 50, 52, and 54; and components 70, 72, and 74 are axial planes. However, the axial planes 70, 72, and 74

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represent and are suggestive of axial slices. The terms image slice, or image plane are used interchangeably in the MRI art, and Figure 2 does suggest and show a "first plurality of slices" [See Figure 2 slices 70, 72, 74]; and the step of "(b) scanning the subject in a second direction which is different from the first direction to take image data of a second plurality of slices;" [See Figure 2 slices 50, 52, and 54; or the back projected lines of 60, 62 and 64; which define from the illustration in Figure 2 itself an additional scanning of slices in "a second direction which is different from the first direction". The applicant also argues that the reference teaches the fusing of only parallel slices, however the examiner notes that **Freundlich et al.**, teaches taking image data of multiple, non-parallel slices, when imaging a non-flat object such as a human spine shown in Figure 3. Additionally, Figure 2 itself is an illustration of how images can be registered, and / or fused with one another; along with the axes and angles used for that purpose. Figure 2 is suggestive directly of applicant's steps. The ability to use perpendicular/orthogonal slices and parallel imaging slices is also directly suggested from the illustration of figure 2 where the hatched lines show conventional orthogonal slices, and the solid line show the appropriate demarcations for oblique slices. The applicant's arguments in the June 28th 2002 response are simply not persuasive.

8. A telephone Interview was conducted with the examiner on July 2nd 2002 with applicant's attorney, which addressed the issues from the March 28th 2002 office action. Applicant proposed a possible draft amendment to the claims, and a telephone interview with one of the inventors and the examiner. The proposed draft was received by the examiner and the interview was held on July 16th 2002, the inventor present was Dr. Kevin J. Parker. in the telephone interview with: the

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examiner, the inventor Dr. Parker, and the applicant's representative David J. Edmondson, it was acknowledged by all parties present that Figures 1 through 4, of the **Freundlich et al.**, reference did currently suggest, and/or show the features of the independent claims as originally filed because the distinguishing features of applicant's invention, from the disclosed specification were not a clear feature of the independent claims as filed. Applicant expressed a desire to rectify this issue, and the examiner agreed to consider any supplemental amendment filed. However, as of the date of this office action no official response concerning the "draft" claims discussed with the examiner in the telephone interview of July 16th 2002 has been received. This action is therefore in response to the official response to office action with an OIPE stamp dated June 28th 20002, and the supplemental Response to Office Action with an OIPE stamp date of July 8th 2002.

9. In the July 8th 2002 response the applicant requested that the examiner cite and make of record any textbooks needed for any subsequent rejection of the claims. The textbook support for the examiner's position is cited at the end of this action.

10. As of the date of this office action, the claims have not been amended, and the Figures of the **Freundlich et al.**, still suggest and show the limitations of the currently pending claims, therefore a final office action is warranted, based upon the claims as currently pending, and not the proposed draft claims discussed in the telephone interview of July 16th 2002. The examiner notes that the formal written arguments presented in the June 28th 20002 response are non-persuasive for the reasons given earlier, and that the arguments presented in the July 16th telephone interview, can not be considered because no formal amendments or arguments from that interview have been received.

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***Claim Rejections - 35 USC § 102***

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

12. **The rejection of Claims 1, 2, 4-10, 28, 29, and 31-37 under 35 U.S.C. 102(b) as being anticipated by Freundlich et al., PCT publication WO 98/24063 published 4 June 1998 are maintained and made final.**

13. With respect to **Claim 1**, and corresponding **system claim 28, Freundlich et al.**, teaches shows, and suggests “A method of forming an image of a subject”, [See abstract] “the method comprising: **(a)** scanning the subject in a first direction” (i.e. an axial direction)” to take image data of a first plurality of slices” [See Figure 2 slices 70, 72, 74]; “**(b)** scanning the subject in a second direction which is different from the first direction to take image data of a second plurality of slices;” [See Figure 2 slices 50, 52, and 54; **or** slices 60, 62 and 64] **( c )** registering the first plurality of slices with the second plurality of slices; [See page 4 line 28 through page 5 line 3; page 7 lines 20-22; page 8 lines 21-24; page 8 lines 33-35; page 8 line 37 through page 9 line 14; page 11 lines 5-23; page 13 lines 1-14; page 13 line 31 through page 14 line 2; and the entire reference in general] “and **(d)** fusing the first plurality of slices with the second plurality of slices to form the image.” [See page 6 lines 14-23; page 7 lines 36-38; page 9 lines 7-14; page 14 lines 15-28; page 15 lines 29-33; page 16 lines 21-24] The examiner notes that a scanning means and the computing means (i.e. for **claim 28**) are shown and suggested by the components of Figure 1.

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14. With respect to **Claim 2**, and corresponding **system claim 29**, **Freundlich et al.**, suggests that “the second direction is orthogonal to the first direction”. [The examiner notes that this limitation is suggested from Figure 2 the dot-dashed line 56 shows the axis of the standard x,y coordinate system, and the dashed lines indicate lines of conventional orthogonal slices to slices 70, 72, and 74]. Additionally although **Freundlich et al.**, teaches on page 11 lines 6-7 that “oblique slices are taken along arbitrary planes, generally not perpendicular to axis 34”, (i.e. the orthogonal axis); This teaching suggests that slices which are perpendicular to axis 34 are obtainable by the **Freundlich et al.**, technique and are within the scope of the **Freundlich et al.**, teachings, because although not generally obtained slices perpendicular to axis 34 are possible. The same reasons for rejection, that apply to **claims 1, 28** also apply to **claims 2, 29**.

15. With respect to **Claim 4**, and corresponding **system claim 31**, **Freundlich et al.**, suggests that “step ( c ) comprises maximizing a correlation based on the image data of the first and second pluralities of slices.” [See page 13 lines 24 through page 14 line 28; page 11 lines 4-23; page 6 lines 6-12; page 4 lines 6-16; page 2 lines 34-36; and the entire reference in general.]The same reasons for rejection, that apply to **claims 1, 28** also apply to **claims 4, 31**.

16. With respect to **Claim 5**, and corresponding **system claim 32**, **Freundlich et al.**, suggests that “the correlation is a correlation of gradients of the image data of the first and second pluralities of slices.” [See where the examiner is considering the angle  $\phi$ , translated by displacement  $\delta$  to represent the gradient of the slices, illustrated in Figure 2. See also page 13 lines 24 through page 14 line 28; page 11 lines 4-23]. The same reasons for rejection, that apply to **claims 1, 4, 28, 31** also apply to **claims 5, 32**.

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17. With respect to **Claim 6**, and corresponding **system claim 33**, **Freundlich et al.**, suggests by illustration that “the correlation is maximized through a hill climbing technique” because slices 50, 52, 54, and slices 60, 62, and 64 directly suggest by the illustration of the Figure itself that the slices are acquired in a “hill climbing” manner. The same reasons for rejection, that apply to **claims 1, 4, 5, 28, 31, 32** also apply to **claims 6, 33**.

18. With respect to **Claim 7**, and corresponding **system claim 34**, **Freundlich et al.**, teaches and suggests that “the hill-climbing technique is a multi resolution hill-climbing technique” because throughout the reference **Freundlich et al.**, teaches that the resolution obtained depends on the angle  $\phi$  and the slice orientation angle  $\theta$ , where slice thickness and slice spacing are arbitrary, and the positioned slices are not required to be equally spaced, (i.e. they may be unequally spaced). A main feature of the reference is that different slices can have different resolutions as required by the imaging system, or specific medical application. [See the entire reference in general, all of the parenthetical citations in **claims 1, 2, 4, 5**, and **6** are also applicable.] The same reasons for rejection, that apply to **claims 1, 2, 4, 5, 6, 28, 29, 31, 32, 33** also apply to **claims 7, 34**.

19. With respect to **Claim 8**, and corresponding **system claim 35**, **Freundlich et al.**, teaches and suggests that **steps (a) and (b)** are performed with a device having an in-plane resolution,” (i.e. axial slices within the plane of the each slice) [See page 1 lines 17-23 and the entire reference in general]. **Freundlich et al.**, suggests that the multi resolution hill-climbing technique” (i.e. suggested from Figure 2) is performed with a plurality of resolutions including: (I) a maximum resolution which is” at least “twice the in-plane resolution”; [The examiner notes that the



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**Freundlich et al.**, reference teaches a resolution that is 5 times better in the in-plane direction than the axial direction; and a minimum resolution that is 1/fifth the resolution of the in-plane direction for the axial direction. This suggest a range with a maximum of 5 times the in-plane resolution and a minimum of 0.2 time the in-plane resolution, therefore since applicant's range of 2 times the in-plane resolution, for a maximum and 0.25 for a minimum fall within the 0.20 minimum to 5 times the in-plane resolution maximum, this limitation is suggested by the **Freundlich et al.**, reference. See page 1 lines 17-23 and the entire reference in general] The same reasons for rejection, that apply to **claims 1, 2, 4, 5, 6, 7, 28, 29, 31, 32, 33, 34** also apply to **claims 8, 35**.

20. With respect to **Claim 9**, and corresponding **system claim 36**, **Freundlich et al.**, teaches and suggests the hill-climbing technique" (i.e. See Figure 2) "is used to determine both a relative displacement (i.e.  $\delta$ ,  $\Delta$ ,  $\theta$ ) and a relative rotation (i.e.  $\phi$ ) between the first and second pluralities of slices. [See Figure 2; page 13 line 31 through page 14 line 2; page 11 lines 4-34; page 8 line 30 through page 9 line 14; and the entire reference in general.]The same reasons for rejection, that apply to **claims 1, 2, 4, 5, 6, 28, 29, 31, 32, 33** also apply to **claims 9, 36**.

21. With respect to **Claim 10**, and corresponding **system claim 37**, **Freundlich et al.**, teaches and suggests "the correlation is a correlation of a subsample of the image data of the first plurality of slices with a subsample of the image data of the second plurality of slices, the subsamples being taken in accordance with gradients of the image data." [See the entire reference, the oblique slices are interpreted as applicant's subsample of the image data, and from the entire reference it is clear that the "gradients of the image data" (i.e. distances  $\Delta$ ,  $\delta$ ,  $\theta$  and angle  $\phi$ , define the gradients of

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the oblique planes in figure 2)]. The same reasons for rejection, that apply to **claims 1, 4, 5, 28, 31, 32** also apply to **claims 10, 37**.

***Claim Rejections - 35 USC § 103***

22. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

23. The rejection of **Claims, 11-13, and 38-40** under **35 U.S.C. 103(a)** as being unpatentable over **Freundlich et al.**, PCT publication WO 98/24063 published 4 June 1998; in view of **Maier et al.**, US patent 5,786,692 issued July 28th 1998 are **maintained and made final**.

24. With respect to **Claim 11**, and corresponding **system claim 38**, **Freundlich et al.**, lacks directly teaching that “the image data of the first plurality of slices have a low resolution in the first direction and a high resolution in directions orthogonal to the first direction; and the image data of the second plurality of slices have the low resolution in the second direction and the high resolution in directions orthogonal to the second direction;” because orthogonal directions are not directly taught. However, **Maier et al.**, teaches direction y and z to be orthogonal directions, [See col. 3 lines 6-27.] Both **Freundlich et al.**, and **Maier et al.**, teach that resolution in one direction can be lower than the in-plane direction. [See **Maier et al.**, col. 7 lines 3-22, Table 1, col. 8 line 36 through col. 9 line 3; See **Freundlich et al.**, See page 6 lines 13-23; page 9 lines 7-8; page 14 lines 12-28; and the entire reference in general]. The teachings of the **Maier et al.**, reference can

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be combined with teachings of **Freundlich et al.**, because both references teach methods for forming an image of a subject, that involve scanning a subject in more than one direction and the actual forming of an image. **Freundlich et al.**, suggests that step (d) comprises fusing the first plurality of slices with the second plurality of slices such that the image has the high resolution in all directions.” [See page 6 lines 13-23; page 9 lines 7-8; page 14 lines 12-28] The same reasons for rejection, that apply to **claims 1, 28** also apply to **claims 11, 38**.

25. With respect to **Claim 12**, and corresponding **system claim 39**, **Freundlich et al.**, suggests that step (d) comprises treating the image as a linear combination of functions (i.e. back projected value lines) “having the low resolution” (i.e. prior to fusing) and deriving the functions from the image data of the first and second pluralities of slices” [See page 6 lines 13-23; page 9 lines 7-8; page 13 lines 1-14 page 14 lines 12-28]. The same reasons for rejection, that apply to **claims 1, 11, 28, 38** and the motivation to combine that applies to **claims 11 and 38**, also apply to **claims 12, 39**.

26. With respect to **Claim 13**, and corresponding **system claim 40**, **Freundlich et al.**, suggests that “the functions are derived through an iterative process using the image data of the first and second pluralities of slices as initial assumptions for the functions.” [See the entire reference in general} **Additionally, Maier et al.**, teaches the iterative process of line scanning with interleaving, and teaches multiple functions throughout the reference including sin and cos functions in the determination of the image slices. [See the entire reference.] The same reasons for rejection, that apply to **claims 1, 11, 12, 28, 38, 39** and the motivation to combine that applies to **claims 11 and 38**, also apply to **claims 13, 40**.

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27. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

28. A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

29. ***Prior Art of Record***

30. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

A) **Stark et al.**, US patent 5,568,400 issued October 22nd 1996

B) **Freundlich et al.**, US patent 6,178,220 B1 issued January 23rd 2001; with a 102 ( e ) date of October 18th 1999.

C) Catherine **Westbrook** and Carolyn Kaut textbook "MRI in Practice **SECOND EDITION**" Blackwell Science, Inc., pages 47-57 and pages 101-103 1998.

D) **Bushberg et al.**, textbook "The Essential Physics of Medical Imaging". Williams and Wilkins Philadelphia pages 325-327; 332-333; 336-339 1994.

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***Conclusion***


31. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is (703) 305-0430. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

32. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Lefkowitz, can be reached on (703) 305-4816. The fax phone number for the organization where this application or proceeding is assigned is (703)305-3432 .

33. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-0956.

TAF

July 23, 2002

  
EDWARD LEFKOWITZ  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800